Hybrid Collaboration on a Wall-Sized Display: using Virtual Reality to integrate Remote Users into the Collaboration Space

Master level internship at IMT Atlantique (Brest)

Team and location: INUIT team / Lab-STICC, IMT Atlantique, Brest campus, France
Duration: 5-6 months
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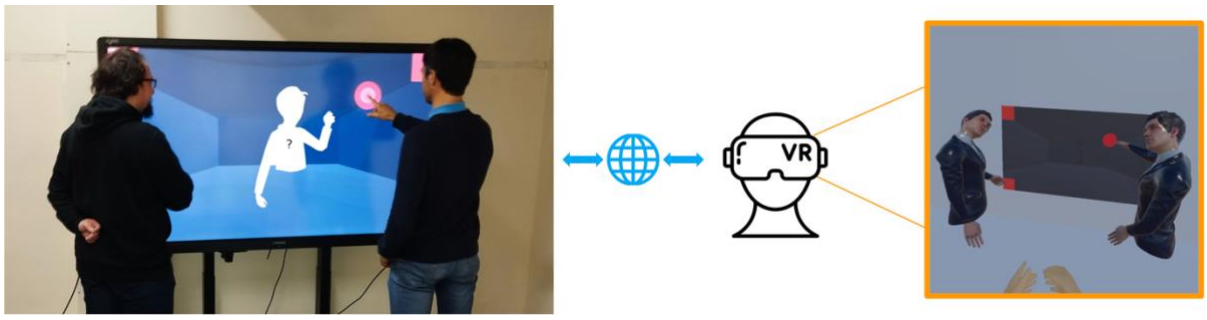
Keywords: Mixed Reality, collaboration, metaverse



Context: Large wall-sized displays [2] enable users to explore large datasets, such as hundreds of brain scans [1], CAD design alternatives [12], or conference planning sessions [9]. They are also powerful tools for fostering collaboration among co-located users, as they allow collaborators to easily perceive each other's activities, share information, and distribute tasks [10, 12]. Including remote participants in such collaborative settings [3, 5, 6, 8, 11, 13, 14] is increasingly necessary due to major societal changes such as new work practices (teleworking) and the green transition. This project focuses on hybrid collaboration scenarios where remote users do not have access to a physical wall-sized display. Such scenarios are common today, as more and more collaborators travel or work from home.

Scientific objectives and research questions: The project plans to use virtual reality (VR) to emulate the wall-sized display in a virtual environment, making it accessible to remote users. In this setting, the remote users will wear VR headsets to view and interact with the digital content. This asymmetric configuration raises two main research questions regarding:
(1) How to represent co-located and remote users to ensure proper awareness among them?
(2) How to provide appropriate interaction, collaboration and communication capabilities to all users, whether they are in front of the wall-sized display or in VR?
These two aspects are essential for fully integrating remote users, such that they can establish a common ground [4] with the co-located users and collaborate with the same interaction capabilities. Instead of trying to mimic physical co-location, we aim to explore solutions that take advantage of this asymmetric configuration to enhance collaboration, along the lines of the "beyond being there" concept introduced by Hollan & Stornetta [7].

Internship Goals: This internship is a follow-up to another internship that has already worked on the project. This earlier work led to the development of an initial prototype that creates a virtual copy of a large screen in a virtual environment and synchronized it with the real large screen. It comes with a set of tools to calibrate the virtual copy of the large screen and to

position it in the physical space of the VR-headset users. Several representations have been proposed to display the VR-headset users on the large screen, which still need to be evaluated and compared with each other.

The intern will work on the following tasks:

- Review the literature on heterogenous collaborative situations between immersive and non-immersive devices, and on how to represent users in such situations.
- Improve the representations of the VR-headset users on the large screen, and possibly propose new ones.
- Design and conduct a user study to evaluate and compare these representations.
- This internship could also investigate how large-screen users and VR-headset users will interact with shared content, leveraging the strengths of both devices.

Requirements: We are looking for students who are enthusiastic about AR/VR technology and are interested in research in Human-Computer Interaction. The intern is expected to have solid programming skills, and ideally, previous experience with C# and Unity 3D. An experience in designing and conducting user studies will be a plus.

The internship could lead to a Ph.D. thesis.

References:

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